



An Air & Water Technologies Company

US EPA RECORDS CENTER REGION 5



501448

December 1, 1994

VIA FACSIMILE

Mr. Joe Fredle
U.S. Environmental Protection Agency
Region 5, Eastern District Office
25089 Center Ridge Road
Westlake, Ohio 44145

Subject: Granville Solvents Site (GSS) Removal Action
Aquifer Test Operational Plan

Dear Mr. Fredle:

Pursuant to the U.S. EPA's comments on the Draft Work Plan (October 18, 1994) in a letter dated November 8, 1994 and November 16, 1994, and as agreed in our responses to those comments provided to you November 18, 1994, the Granville Solvents Site PRP Group herein delivers the Operational Plan for the Aquifer Pumping Test. As requested by Mr. Edward Hanlon, a copy of this document will be sent to Mr. Steve Acree of the U.S. EPA.

If you have questions regarding this submittal, please call Mr. Ben Pfefferle at 614-469-3200 or Michael Raimonde at the number below.

Respectfully,

METCALF & EDDY, INC.

Michael Raimonde for:

Gerald R. Myers
Vice President/Project Coordinator

cc: Edward Hanlon, U.S. EPA
Mike Anastasio, U.S. EPA
Fred Myers, Ohio EPA
Steve Acree, U.S. EPA
Ben Pfefferle, TH&F



OPERATIONAL PLAN

of the

AQUIFER PUMPING TEST

for the

REMOVAL ACTION

at the

GRANVILLE SOLVENTS SITE

by:



**Metcalf & Eddy, Inc.
2800 Corporate Exchange Drive, Suite 250
Columbus, Ohio 43231**

December 1, 1994

TABLE OF CONTENTS

1.0	INTRODUCTION	1
2.0	GENERAL AQUIFER PUMPING TEST DESIGN	1
2.1	Establishing Baseline Water Level Trend	1
2.2	Short Term Aquifer Pumping Test	3
2.2.1	Water Level Measurements	3
2.2.2	Test Well	3
2.2.3	Observation Well Network	8
	Piezometers	8
	Monitoring Wells	15
	Other Wells	15
2.2.4	Data Collection Procedures	18
2.3	Long Term Aquifer Pumping Test	18
2.4	Pumping Test Data Evaluation	19
3.0	GROUNDWATER MONITORING WELL SAMPLING PROCEDURES	20
4.0	DISCHARGE REQUIREMENTS AND EXPECTED DISCHARGE CONCENTRATIONS	20

LIST OF FIGURES

Figure 1.	Aquifer Pumping Test Layout	2
Figure 2.	GSS-EW2 Pilot Hole Boring Log	4
Figure 3.	GSS-EW2 Pilot Hole Sample Sieve Analysis	7
Figure 4.	Boring Log for GSS-P1	9
Figure 5.	Boring Log for GSS-P2	11
Figure 6.	Well Construction Diagram for GSS-P1	13
Figure 7.	Well Construction Diagram for GSS-P2	14
Figure 8.	Boring Log for GSS-MW2	16
Figure 9.	Well Construction Diagram for GSS-MW2	17

LIST OF TABLES

Table 1.	Water Discharge Requirements and Expected Concentrations	21
Table 2.	Air Discharge Requirements and Expected Concentrations	22

1.0 INTRODUCTION

The purpose of this Operational Plan is to provide a description of the operational procedures for the Aquifer Pumping Test during the Removal Action at the Granville Solvents Site (GSS). This description is intended to augment the information provided in the Work Plan for the Removal Action dated October 19, 1994 and revised November 18, 1994.

The Operational Plan is separated into four major sections: Section 1 - Introduction, Section 2 - General Aquifer Pumping Test Design, Section 3 - Groundwater Monitoring Well Sampling Procedures, and Section 4 - Discharge Requirements and Expected Discharge Concentrations.

2.0 GENERAL AQUIFER PUMPING TEST DESIGN

The aquifer test will be conducted in three segments: establishing baseline water level trend, short term aquifer pumping test, and long term aquifer pumping test. Each of these segments are described below. The aquifer test will be conducted by pumping extraction wells GSS-EW1 and GSS-EW2 as described below. Observation wells for the test will include GSS-P1, GSS-P2, MW-8D, MW-7D, GSS-MW1, GSS-MW2, and PW-1 (Figure 1).

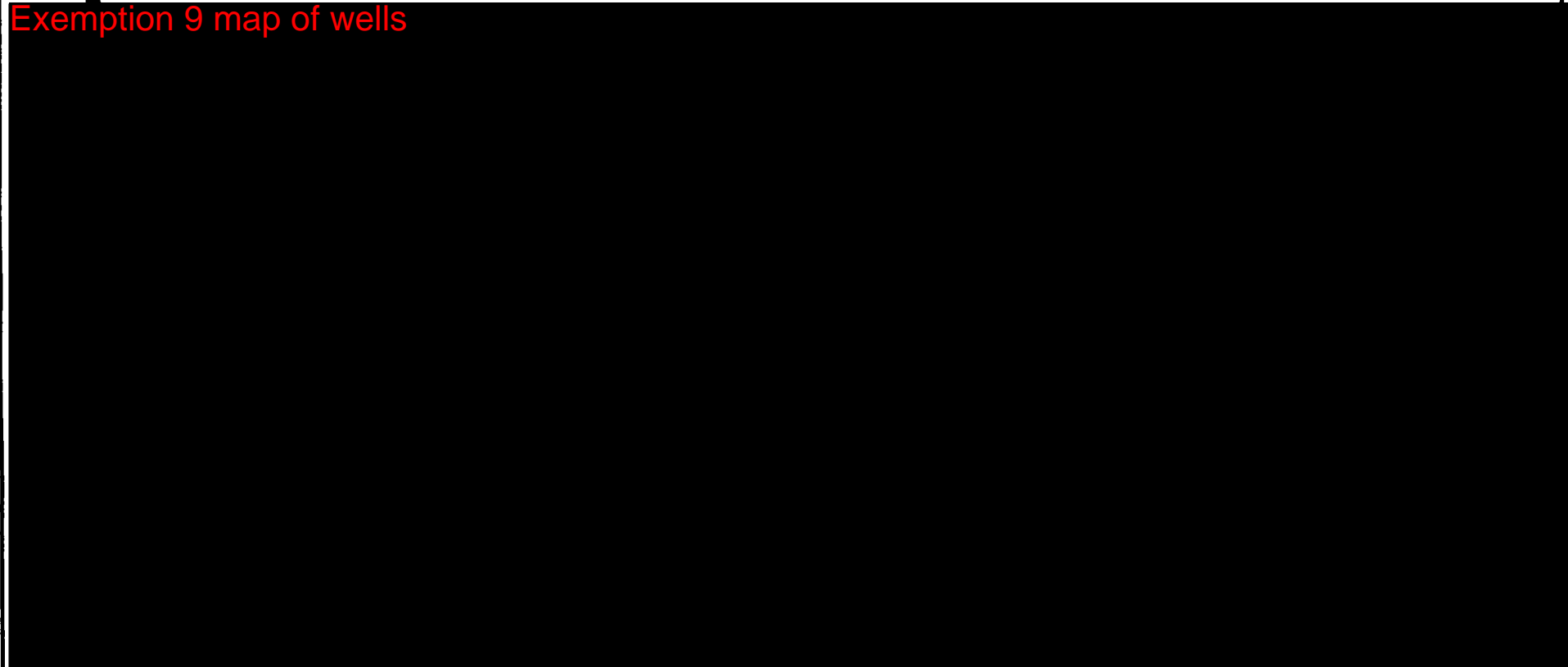
2.1 ESTABLISHING BASELINE WATER LEVEL TREND

Approximately four days prior to the aquifer test, water levels will be measured and recorded once in all observation wells to be used in the test. In addition, water levels will be measured and recorded in the test well GSS-EW2, and observation wells GSS-P1, GSS-P2, and MW-7D using pressure transducers and a data logger. The frequency of measurement for these four wells will be approximately once every sixty minutes for the four days prior to the test. The rate and duration of pumping of Village production wells PW-2 and PW-3 during this time period will be obtained from the Village of Granville, if available. Data collected before the pumping test will be used to produce potentiometric maps to further define background hydraulic gradients and flow directions. These will be compared to data collected during pumping to evaluate the pumping influence.

Barometric pressure will also be recorded for four days before the test and during the test period. A barometer will be placed in one of the wells above the water level. Barometric, precipitation, and other meteorological data will also be obtained from a local weather station. The barometric data will be used



Exemption 9 map of wells



EXPLANATION

- HP = HYDROPUNCH LOCATION
- ◆ = GROUNDWATER MONITORING WELL
- ⊕ = OBSERVATION WELL
- ⊗ = EXTRACTION WELL

SCALE IN FEET
0 80 160



GRANVILLE SOLVENTS SITE
PUMPING TEST LAYOUT
GRANVILLE, OHIO

Project Number
016688-0006

File Name	Figure
6688-1	1

to determine if changes in atmospheric pressure influence water levels in the aquifer. If so, the pumping test data will be adjusted to account for barometric effects.

2.2 SHORT TERM AQUIFER PUMPING TEST

A short-term pumping test will be conducted by pumping extraction well GSS-EW2 at a constant rate for a period of 72 hours. The purpose of the short term aquifer test is to determine the aquifer properties in the vicinity of the test well under time-dependent conditions. The following sections describe the basic procedures that will be followed for this test.

2.2.1 Water Level Measurements

Prior to the start of the short term aquifer test, water levels will be measured using a weighted surveyor's steel tape and water sensing paste in the test well GSS-EW2 and the observation wells GSS-P1, GSS-P2, MW-8D, MW-7D, GSS-MW1, GSS-MW2, and PW-1. Use of the weighted tape is the preferred method for measuring water levels to the greatest accuracy. The water elevation of Raccoon Creek will also be measured at the surveyed location on the Cherry Street overpass. If practical, water levels will be measured and recorded for the other existing monitoring wells on the Site.

2.2.2 Test Well

The short term aquifer test will be conducted by pumping extraction well GSS-EW2, currently under construction. The boring log for the pilot hole is shown in Figure 2. GSS-EW2 is designed with telescoping well construction extending from the surface (916 feet amsl) to an elevation of 824 feet amsl (a depth of 92 feet). The well is designed to be constructed of 10-inch inside diameter black iron pipe extending from the surface to an elevation of 874 feet amsl. A telescoping well screen will extend from 874 feet amsl to 824 feet amsl (42 to 92 feet). The screen will be 304 stainless steel wire wrapped with 0.04-inch slot opening (custom manufactured from Cook Well Screen). The screen design is based on a grain size determination by standard sieve analysis of a sample of the aquifer collected from a pilot hole drilled at the location of GSS-EW2 (Figure 3). The slot size was chosen to optimize well performance and allow retention of 50% of the formation material.

The well is designed to provide production of 250 gallons per minute (gpm). However, during the short term aquifer pumping test, GSS-EW2 will be pumped at a constant rate of approximately 100 gpm. The

PILOT

PROJECT: GRANVILLE SOLVENTS SITE		SHEET 1 OF 3	BORING NO. GSS-EW2
SITE LOCATION GRANVILLE, OHIO VICINITY OF WATER TREATMENT PLOT		JOB NO. 016688-6 LOCATION: EAST OF TREATMENT PLANT	GROUND ELEV. 917.411 TOTAL DEPTH 127

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH FEET	SAMPLE RECOVERY	BLOW COUNT (per 6 inches) OR DRILLING TIME (min/ft)	% RECOVERY OR RND	SAMPLE DESCRIPTION	GRAPHIC LOG
11/7/41	SS	5-7	6"	2.2-2.1		light brown clay with silt. dense, low plasticity, w/ small (< 2") lens of fine-grained sand and silt. dry.	
	SS	10-12	3"	1.1-1.1		silt rich clay w/ trace fine sand low plasticity. trace fine pebbles, rounded. dry.	
	SS	15-17	15"	6.7-7.8		fine - to medium - grained sand with well rounded fine pebbles. light yellow. poorly graded. damp	
	SS	20-22	14"	6.7-7.7		fine - to coarse - grained sand, gravel (RND), in a silt matrix. wet, gray well graded.	
	SS	25-27	10"	11.9-10.9		same as above	sand heave in auger
	SS	30-32	24"	3.3-3.4		same as above	
	SS	35-37	24"	34.5-5		fine-grained to coarse-grained sand and fine gravel with silt + minor clay matrix.	
	SS	40-42	24"	1.1-4.6		same as above, large pebble in end of spoon.	
	SS	45-47	24"	7.6-5.7		not representative - sand heave	
	SS	50-52	8"	2.4-5.7		gray fine - to coarse - grained sand and fine gravel with silt + minor clay matrix	
	SS	55-57	6"	3.7-7.4		same as above	

SAMPLE TYPES
SS=SPLIT SPOON, ST=SHELBY TUBE
R=ROCK CORE, O=OTHER

NOTES:

BORING NO.:
GSS-EW2

PILOT BORING

PILOT

PROJECT: GRANVILLE SOLVENTS SITE		SHEET 2 OF 3	BORING NO. GSS-EW2
SITE LOCATION: GRANVILLE, OHIO VICINITY OF WATER TREATMENT PLANT		JOB NO. 016688-6 LOCATION: EAST OF TREATMENT PLANT	GROUND ELEV. 917.44L TOTAL DEPTH 127 FEET

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	BLOW COUNT (per 6 inches) OR DRILLING TIME (min/ft)	% RECOVERY OR RCD	SAMPLE DESCRIPTION	GRAPHIC LOG
	SS 60-62	8"	7.7.7.5			AS ABOVE	
	SS 65-67	8"	10.9.9.9			SAME AS ABOVE, SUBROUNDED PEBBLE (1") PRESENT IN MIDDLE OF SAMPLE	
	SS 70-72	14"	14.15.17.17			GRAY FINE- TO COARSE SAND AND GRAVEL WITH SILT MATRIX. MODERATELY WELL GRADED. GRAVEL UP TO 1/2" DIAMETER.	
3"	SS 75-77	14"	47.72.72.71			SAME AS ABOVE, END OF SPOON SILT-RICH CLAY TO CLAY-RICH SILT w/ high plasticity, dense.	
	ST 80-92	14"	23.24.25.25			AS ABOVE	
	SS 85-87	24"	4.10.19.12			SILT-RICH CLAY TO CLAY-RICH SILT w/ MINOR FINE-GRAINED SAND. MINOR CLAY LENSES w/ MEDIA TO HIGH PLASTICITY. FEW MEDIUM PEBBLE, MODERATELY ROUNDED ~5%.	
	SS 90-92	13"	15.24.42.53			SAME AS ABOVE	
	SS 95-97	16"	8.27.24.20			SAME AS ABOVE	
	SS 100-102	20"	11.28.50.52			SAME AS ABOVE	
SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER						NOTES:	BORING NO.: GSS-EW2

PILOT

Pilot

PICOT

CTL Engineering Inc.

2860 Fisher Road, P.O. Box 44469, Columbus, Ohio 43204
Phone: 614/276-8123 • Fax: 614/276-6377



Consulting Engineers • Testing • Inspection Services • Analytical Laboratories

Established in 1927.

REPORT ON SAMPLE OF SAND AND GRAVEL

CLIENT: Metcalf & Eddy, Inc.
2800 Corporate Exchange Drive
Columbus, OH 43231

DATE REPORTED: 11-22-94
DATE TESTED: 11-21-94
DATE RECEIVED: 11-18-94
SAMPLED BY: CLIENT

LAB CODE NO: 94-6318

IDENTIFICATION: Sand & Gravel Geotechnical Sample 75' to 87'

SIEVE ANALYSIS (ASTM C-136)

<u>SIEVE SIZE</u>	<u>% PASSING</u>
2"	100
1-1/2"	98
1"	95
3/4"	88
1/2"	79
3/8"	73
#4	63
#8	53
#16	43
#30	32
#50	20
#100	14
#200*	10.6

* = Washed Grading (ASTM C-117)

Respectfully submitted,
CTL ENGINEERING, INC.

Larry Pishitelli
Laboratory Supervisor

David A. Breitfeller, P.E.
Project Engineer

well will be outfitted with a submersible pump constructed primarily of stainless steel and capable of pumping 250 gpm under the assumed pressure head conditions. The pump will be placed in a section of blank casing in the bottom ten feet of the well, below the well screen.

The extraction rate will be measured using an in-line flow meter at a frequency of once every hour for the initial part of the test and periodically thereafter. The meter will also allow measurement of the cumulative volume pumped during the test.

2.2.3 Observation Well Network

The observation well network will consist of the following wells: GSS-P1, GSS-P2, MW-8D, MW-7D, GSS-MW1, GSS-MW2, and PW-1 as shown on Figure 1.

Piezometers

Two piezometers were installed in the vicinity of test well GSS-EW2 (GSS-P1 and GSS-P2) to be used as observation wells during the short term aquifer pumping test. Observation well GSS-P1 was installed 20 feet northeast of GSS-EW2 and GSS-P2 was installed 40 feet southeast of GSS-EW2. The borings in which these wells were installed were drilled using 4.25-inch inside diameter hollow stem augers. The borings were logged by using two-inch inside diameter two-foot long split spoon samplers to collect soil cores on five-foot centers (Figures 4 and 5). The water table was encountered at an approximate elevation of 898 feet amsl. Each boring was extended to an elevation of approximately 852 feet amsl, approximately 45 feet below the water table.

Each observation well was constructed using threaded two-inch inside diameter schedule 40 polyvinyl chloride (PVC) riser casing and a twenty foot long PVC well screen with 0.01-inch factory cut slot openings (Figures 6 and 7). The wells were installed by placing the well riser casing and screen inside the augers and adding 20/40 clean silica sand while progressively removing the augers, allowing the sand to fill the annular space between the well screen and the natural aquifer material. The sand was added to an elevation approximately two feet above the top of the well screen. Bentonite pellets were placed on top of the filter pack in six-inch lifts to a total thickness of no less than two feet. The bentonite was allowed to hydrate prior to the placement of a bentonite cement

PROJECT : GRANVILLE SOLVENTS SITE					SHEET 1 OF 2		BORING NO. GSS-P1	
SITE LOCATION GRANVILLE OHIO VICINITY OF WATER TREATMENT PLANT					JOB NO. 016698-6 LOCATION: EAST OF WATER TREAT PLANT		GROUND ELEV. 917 AMSL TOTAL DEPTH 65 FEET	
DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH FEET	SAMPLE RECOVERY	BLOW COUNT per 6 inches OR DRILLING TIME (min/sec)	% RECOVERY OR RPD	SAMPLE DESCRIPTION	GRAPHIC LOG	
	SS	5-7	7"	4.3-4.3		CLAY-RICH SILT WITH 5% SUB ANGULAR TO SUB ROUNDED pebbles AND COARSE-GRAINED SAND. MINOR IRON OXIDE STAINING. DRY		
	SS	10-12	19"	4.7-9.6		FINE-GRAINED SAND AND SILT WITH SMALL (1/4") SUBANGULAR PEBBLES. MINOR IRON OXIDE STAINING. LOOSE, DRY. MINOR CLAY IN MATRIX (2-5%)		
	SS	15-17	18"	7.8-8.8		SAME AS ABOVE. INCREASED CLAY CONTENT. DRY		
	SS	20-22	14"	3.5-4.4		FINE- TO COARSE- GRAINED SAND AND FINE GRAVEL WITH A SILT AND CLAY MATRIX. IRON STAINING. WET		
	SS	25-27	19"	4.4-5.4		FINE- TO COARSE- GRAINED SAND AND FINE- TO MEDIUM GRAVEL (1/2" DIAMETER) WITH SILT MATRIX. WELL GRADED		
	SS	30-32	24"	4.4-6.6		AS ABOVE		
	SS	35-37	6"	4.9-11.11		AS ABOVE		
SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER						NOTES:	BORING NO.: GSS-P1	

FIGURE 4

1/2

PROJECT : GRANVILLE SOLVENTS					SHEET 2 OF 2		BORING NO. GSS-P1	
SITE LOCATION GRANVILLE, OHIO VICINITY OF WATER TREATMENT PLANT					JOB NO. 016688-6 LOCATION: EAST OF WATER TREATMENT PLANT		GROUND ELEV. 917 gmsl TOTAL DEPTH 65 FEET	
DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH FEET	SAMPLE RECOVERY	BLOW COUNT (per 6 inches) OR DRILLING TIME (min/ft)	% RECOVERY (% of REQ)	SAMPLE DESCRIPTION	GRAPHIC LOG	
	SS	40-42	4"	18.26.13.12		AS ABOVE		
	SS	45-47	3"	6.6.9.7		COARSE-GRAINED AND FINE TO MEDIUM GRAVEL, WELL GRADED.		
	SS	50-52	10"	4.88.10		FINE- TO MEDIUM-GRAINED SAND AND GRAVEL WITH SILT-RICH MATRIX WITH CLAY.		
	SS	55-57	10"	7.6.5.9		AS ABOVE		
	SS	60-62	10"	6.11.12.12		AS ABOVE		
						TD 65 FEET		
SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER						NOTES:	BORING NO.: GSS-P2	

PROJECT: GRANVILLE SOLVENTS SITE						SHEET 1 OF 2		BORING NO. GSS-P2	
SITE LOCATION: GRANVILLE, OHIO VICINITY OF WATER TREATMENT PLANT						JOB NO. 016689-6 LOCATION: EAST OF WATER TREAT PLANT		GROUND ELEV. 915 GAIL TOTAL DEPTH 63 FEET	

DEPTH	SAMPLE TYPE/NO.	SAMPLE DEPTH	SAMPLE RECOVERY	BLIND COUNT (per 5 inches) OR DRILLING TIME (min/ft)	% RECOVERY (if not)	SAMPLE DESCRIPTION	GRAPHIC LOG
	SS 5-7	11"	10-10.9.9			SILT WITH TRACE CLAY AND MINOR SUB-ANGULAR LIMESTONE PEBBLES. IRON OXIDE STAINING. DRY	
	SS 10-12	12"	12.9-12.13			AS ABOVE. WITH 1" DIAMETER SUB-ROUNDED LIMESTONE PEBBLES.	
	SS 15-17	14	5.4-6.5			SAND-RICH SILT w/ ROUNDED LIMESTONE PEBBLES. IRON OXIDE STAINING. BOTTOM OF SPOON WET.	
	SS 20-22	14	5.4-6.5			FINE-TO MEDIUM-GRAINED SAND AND FINE GRAVEL. SILT MATRIX. WET	
	SS 25-27	8	4.3-4.3			SAME AS ABOVE. PEBBLES RANGE IN SIZE FROM 1/4" TO OVER 1.5".	
	SS 30-32	12'	3.3-5.3			GRAY. AS ABOVE	
	SS 35-37	20"	4.4-3.3			SAME AS ABOVE	
	SS 40-42	9"	6.6-6.6			SAME AS ABOVE	

SAMPLE TYPES SS=SPLIT SPOON, ST=SHELBY TUBE R=ROCK CORE, O=OTHER				NOTES:				BORING NO.: GSS-P2	
--	--	--	--	--------	--	--	--	-----------------------	--

FIGURE 5

FIGURE 5 (CONT.)

DRILLING CONTRACTOR: ~~BECKMAN~~ BUCKSAR

COORDINATES: —

BEGUN: / -2 -

SUPERVISOR: SM

WELL SITE:

EAST - WATER TREAT.
MENT PLANT

WATER LEVEL:

20'

DEPTH/ELEV.

898 EST.

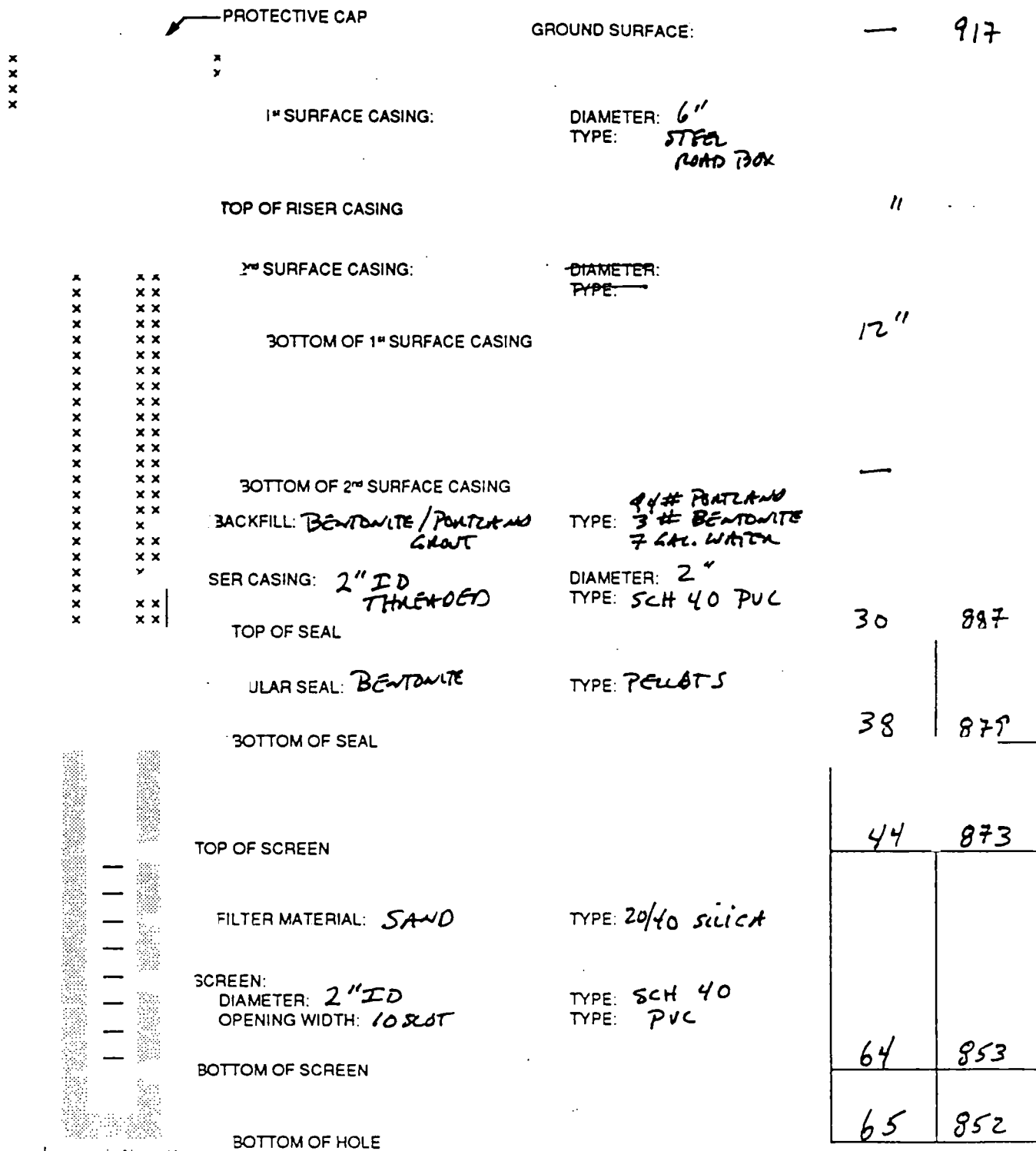
FINISHED: 11-21-94

DRILLER: ~~BECKMAN~~ BUCKSAR

DEPTH IN

ELEV. IN

REFERENCE POINT & ELEVATION:



METHOD DRILLED:

HSA

METHOD DEVELOPED:

COMMENTS:

GSS-P1

M&E Metcalf & Eddy

FIGURE 6

DRILLING CONTRACTOR:

BUCKSAR

COORDINATES:

GRAVITY

50

JOB NO.

01

8

WELL NO. GSS-P2

BEGUN: 11 22 5

SUPERVISOR:

SMITH

WELL SITE:

EAST-WATER TREAT PLANT

WATER LEVEL:

8"

DEPTH/ELEV:

FINISHED: 11/22/94

DRILLER:

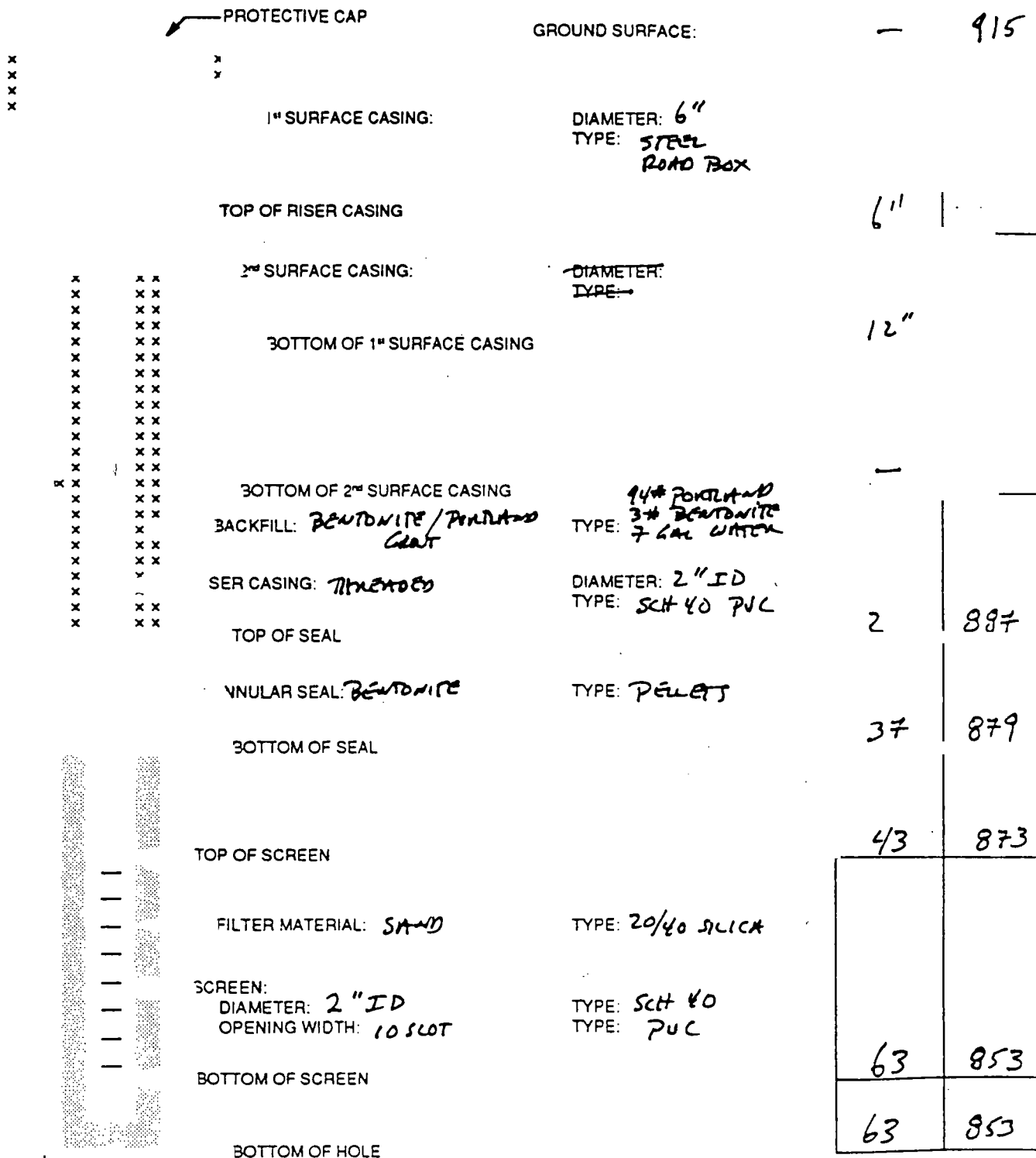
BUCKSAR

897

DEPTH IN

ELEV. IN

REFERENCE POINT & ELEVATION:



METHOD DRILLED:

HSA

METHOD DEVELOPED:

COMMENTS:

GSS-P2



FIGURE 7

grout (mixture: 94 pounds of Type 1 Portland Cement, 3% powdered bentonite, and 7 gallons of potable water) using a side discharging tremie pipe placed at a depth immediately above the bentonite annular seal. The well was finished flush to the ground with a flush-mount protective casing.

Monitoring Wells

One groundwater monitoring (GSS-MW2) well has been installed 100 feet southeast of GSS-EW2 and 150 feet south of monitoring well MW-8. This well will be used as an observation well during the short term aquifer pumping test. The boring was drilled and logged and the well was constructed as described above for the piezometers. Figures 8 and 9 show the boring log and well construction. The water table was encountered at an approximate elevation of 898 feet amsl. The boring was extended to an elevation of approximately 883 feet amsl, 15 feet below the water table.

A second groundwater monitoring well, GSS-MW1 will be installed, pending access approval by the land owner, approximately 100 feet north-northeast of monitoring well MW-8. The well will be installed in the same manner as GSS-MW2, described above.

In addition to groundwater monitoring wells GSS-MW1 and GSS-MW2, previously installed monitoring wells MW-7D and MW-8D will be used during the short term aquifer pumping test as observation wells. It is recognized that partial penetration of the well screen of these monitoring wells will limit their use during this test.

Other Wells

Village of Granville production well PW-1 and groundwater extraction well GSS-EW1 will also be used as observation wells during the short term aquifer pumping test. Well PW-1 extends from the ground surface to an elevation of approximately 800 feet amsl and is screened from 835 feet amsl to the total depth of the well, 100 feet. PW-1 has been temporarily taken out of service as a result of the removal action. The well design for GSS-EW1 is described below in the description of the long term aquifer pumping test.

1/1

FIGURE 8

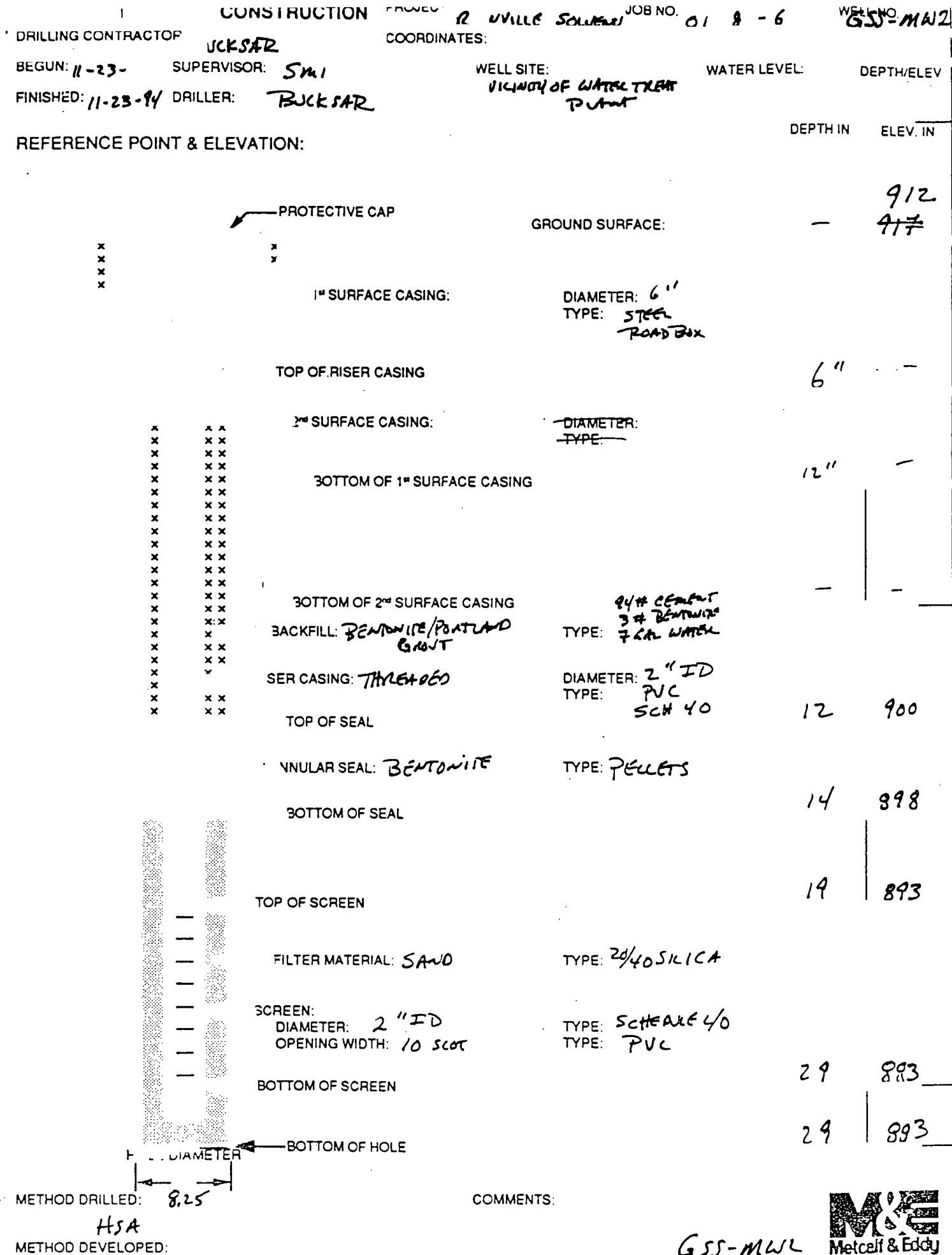


FIGURE 9

2.2.4 Data Collection Procedures

Prior to testing, water levels will be measured and recorded in all wells participating in the test. Water level measurements will be continuously recorded using pressure transducers and a data logger in the test well and in observation wells GSS-P1, GSS-P2, MW-7D, MW-8D, GSS-MW1, GSS-MW2, and PW-1. Test measurements will be taken on a logarithmic cycle (frequent measurements initially and less frequent measurements over time) with the longest period between measurement of approximately 60 minutes. For wells not outfitted with continuous reading instruments, measurements will be made periodically throughout the test, generally once every hour for the first 10 hours, where accessible, and periodically thereafter. For instrumented wells, check measurements by hand will be made frequently, generally once every hour, in the first 8 hours and periodically thereafter. Barometric pressure will also be recorded using a transducer and data logger. The test will target a total pumping time of 72 hours.

The water produced from GSS-EW2 will be sampled for laboratory analysis near the start of the test. The samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOC's) using USEPA Method 524.2 and the metals with applicable discharge limits (see section 4.0) . All water removed from GSS-EW2 during the short duration test will be pumped directly into Raccoon Creek. Sampling of the effluent and handling of the water during the long term test are discussed below.

2.3 LONG TERM AQUIFER PUMPING TEST

Immediately following the 72 hours of pumping in the short term test, a long term aquifer test will commence. The objective of the long term test is to monitor the influence of long term, combined pumping of extraction wells GSS-EW1 and GSS-EW2. A preliminary groundwater flow model presented in the November 18, 1994 Work Plan concluded that pumping of the extraction wells at 100 gpm each would be adequate to control the hydraulic gradient such that the plume would not move toward the Village production wells. Data from both the short and long term tests will be used to evaluate this conclusion.

Well GSS-EW2 will continue to be pumped at the constant rate of 100 gpm for duration of the long term test. The long term test will begin by initiating pumping of well GSS-EW1 at a constant rate of 100 gpm. The duration of the long term test will be 27 days with both extraction wells pumping at 100 gpm. This will result in pumping of GSS-EW2 for a cumulative 30 days.

Extraction well GSS-EW1, is also currently under construction. GSS-EW1 is designed with telescoping well construction extending from the surface (916 feet amsl) to an elevation of 815 feet amsl. The well will be constructed of 10-inch inside diameter black iron pipe extending from the surface to an elevation of 880 feet amsl (36 feet). A telescoping well screen will extend from 880 feet amsl to 860 feet amsl (36 to 56 feet). Below the upper screen, casing will extend from 860 feet amsl to 845 feet amsl (56 to 71 feet). A second screen will be placed between 845 feet amsl to 825 feet amsl (71 to 91 feet). The well screens and separating casing will consist of 304 stainless steel. The screen will be wire wrapped with 0.04-inch slot opening (custom manufactured from Cook Well Screen).

GSS-EW1 is located within the source area where groundwater is most highly impacted. As described in the November 18, 1994 Work Plan, the highest constituent levels are present in the relatively shallow groundwater near this location. To avoid drawing this water deeper into the aquifer, pumping of GSS-EW1 will take place from the upper screen section (36 to 56 feet). A submersible pump, capable of pumping 100 gpm and constructed primarily of stainless steel, will be set slightly below the upper screen. A packer will be placed in the blank casing section below the upper screen and below the pump to isolated the lower portion of the well. The lower screen will be installed to allow for pumping of the lower portion of the aquifer in the future, if necessary. The primary reason for installing the lower screen at this time is to reduce overall costs if it is determined in the future that deep pumping is needed.

During the long term test, the effluent from wells GSS-EW1 and GSS-EW2 will be combined and treated through an air stripper before discharging to Raccoon Creek. Pre-treatment and post-treatment water samples will be collected for laboratory analysis once each week. The samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOC's) using USEPA Method 524.2 and the metals with applicable discharge limits (see section 4.0).

The data collection procedures during the long term pumping test will be similar to those described above for the short term test.

2.4 PUMPING TEST DATA EVALUATION

Water level data obtained during the short term test will be analyzed to determine the properties of the aquifer in the vicinity of the test well. The data will be evaluated by both time-drawdown and distance-drawdown methods. Appropriate, standard methods based on the Theis equations and modifications to

the Theis equations will be employed. Corrections for partial penetration or dewatering will be made if needed, based on review of the data.

Data from both the short and long term tests will be plotted to produce potentiometric maps for various points in time. These maps will allow visual representation of the influence of pumping on the groundwater flow directions. The radius of influence of the pumping wells will be determined based on the aquifer properties and construction of potentiometric maps and/or flow nets. This information will allow further definition of the pumping rates required to control the hydraulic gradient to meet the performance objectives of the system.

3.0 GROUNDWATER MONITORING WELL SAMPLING PROCEDURES

Sampling of monitor wells will take place during the operation of the groundwater extraction system. A quality assurance/quality control (QA/QC) plan discussing sampling and analysis of groundwater for the Granville Solvents Site has been previously submitted and approved. Future sampling will follow the approved plan.

Before sampling, the total well depth and depth to water will be measured with a clean water level indicator. The volume of water in the well will be calculated based on the total height of the water column in the well and the well radius. A minimum of three well volumes will be purged from the well before sampling. Purging will continue until the field-measured parameters (pH, specific conductance, and temperature) have stabilized. The wells will be purged and sampled using bottom-discharging, stainless steel bailers fitted with a sampling stopcock. The monitor well samples will be analyzed for Target Compound List (TCL) volatile organic compounds (VOC's) using USEPA Method 524.2.

4.0 DISCHARGE REQUIREMENTS AND EXPECTED DISCHARGE CONCENTRATIONS

The discharge requirements and expected discharge concentrations for discharge of water to Raccoon Creek and discharge to the air from the water treatment system are listed on Tables 1 and 2, respectively.

TABLE 1
REMOVAL ACTION AT GRANVILLE SOLVENTS SITE
SOURCE AREA PUMP AND TREAT SYSTEM
DISCHARGE OF WATER TO RACCOON CREEK

<i>Constituent</i>	DISCHARGE REQUIREMENTS*				EXPECTED DISCHARGE CONCENTRATIONS			
	Pumping Test*		Treatability Test		Pumping Test*		Treatability Test	
	<i>30-Day Avg (ug/l)</i>	<i>Max</i>	<i>30-Day Avg (ug/l)</i>	<i>Max</i>	<i>30-Day Avg (ug/l)</i>	<i>Max</i>	<i>30-Day Avg (ug/l)</i>	<i>Max</i>
Trichloroethylene	157	2826	5(a)	5(a)	< 157	< 2826	5(a)	5(a)
1,1,1-Trichloroethane	184	3324	200(a)	200(a)	< 184	< 3324	200(a)	200(a)
Tetrachloroethylene	153	849	5(a)	5(a)	< 153	< 849	5(a)	5(a)
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethylene	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--
Cadmium, TR	7.6	35	5(a)	5(a)	< 7.6	< 35	5(a)	5(a)
Copper, TR	72	98	1000***	1000***	< 72	< 98	1000***	1000***
Lead, TR	65	1061	15(a)	15(a)	< 65	< 1061	15(a)	15(a)
Nickel, TR	1047	7632	100(a)	100(a)	< 1047	< 7632	100(a)	100(a)
Zinc, TR	---	525	5000***	5000***	--	< 525	5000***	5000***
Acetone								

--Monitoring Only

*Ohio EPA Policy 100.027

**Ohio EPA Letter of November 14, 1994 to U.S. EPA

***Secondary MCL

(a)Maximum Contaminant Level

TABLE 2
REMOVAL ACTION AT GRANVILLE SOLVENTS SITE
AIR MONITORING EVALUATION

DISCHARGE TO AIR

<i>Constituent</i>	DISCHARGE REQUIREMENTS*				EXPECTED DISCHARGE CONCENTRATIONS			
	Pumping Test*		Treatability Test		Pumping Test*		Treatability Test	
	<i>30-Day Avg (kg/day)</i>	<i>Max</i>	<i>lbs/day</i>	<i>Max</i>	<i>30-Day Avg (kg/day)</i>	<i>Max</i>	<i>lbs/day</i>	<i>Max</i>
Trichloroethylene	0.299	5.39	10	10	<0.299	<5.39	<10	<10
1,1,1-Trichloroethane	0.351	6.34	10	10	<0.351	<6.34	<10	<10
Tetrachloroethylene	0.292	1.71	10	10	<2.92	<1.71	<10	<10
Cis-1,2-Dichloroethylene	--	--	--	--	--	--	--	--
1,1-Dichloroethane	--	--	--	--	--	--	--	--
1,1-Dichloroethylene	--	--	--	--	--	--	--	--
Trans-1,2-Dichloroethylene	--	--	--	--	--	--	--	--
Chloroform	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--
Cadmium, TR	0.014	0.067	10	10	<0.014	<0.067	<10	<10
Copper, TR	0.14	6.19	10	10	<0.14	<6.19	<10	<10
Lead, TR	0.12	2.02	10	10	<0.12	<2.02	<10	<10
Nickel, TR	2.0	14.6	10	10	<2.0	<14.6	<10	<10
Zinc, TR	---	1.0	10	10	--	<1.0	<10	<10
Acetone								

--Monitoring Only

*Ohio EPA Policy 100.027

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